Opportunities and stumbleblocks for optics in servers

Ronald Luijten

Data motion architect
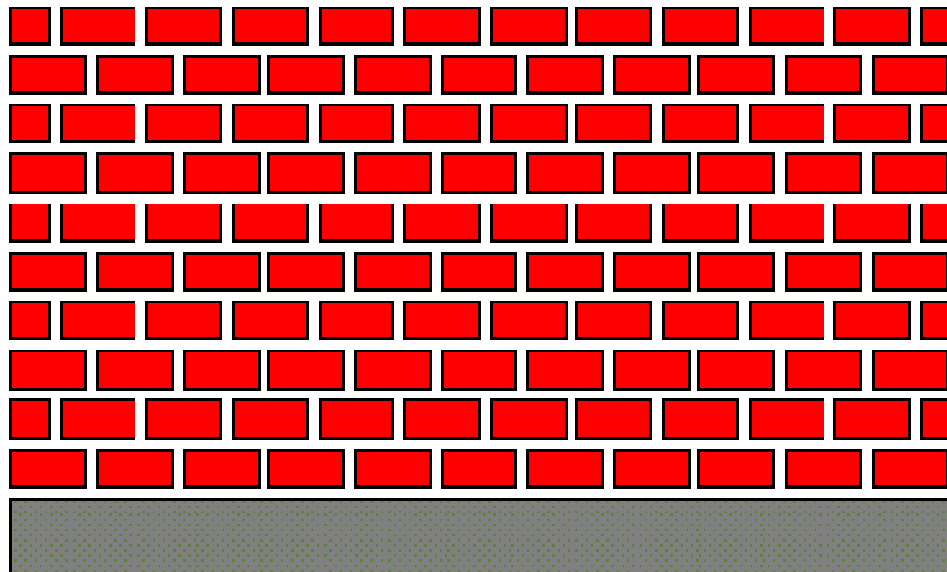
Zurich Research Lab (IBM)

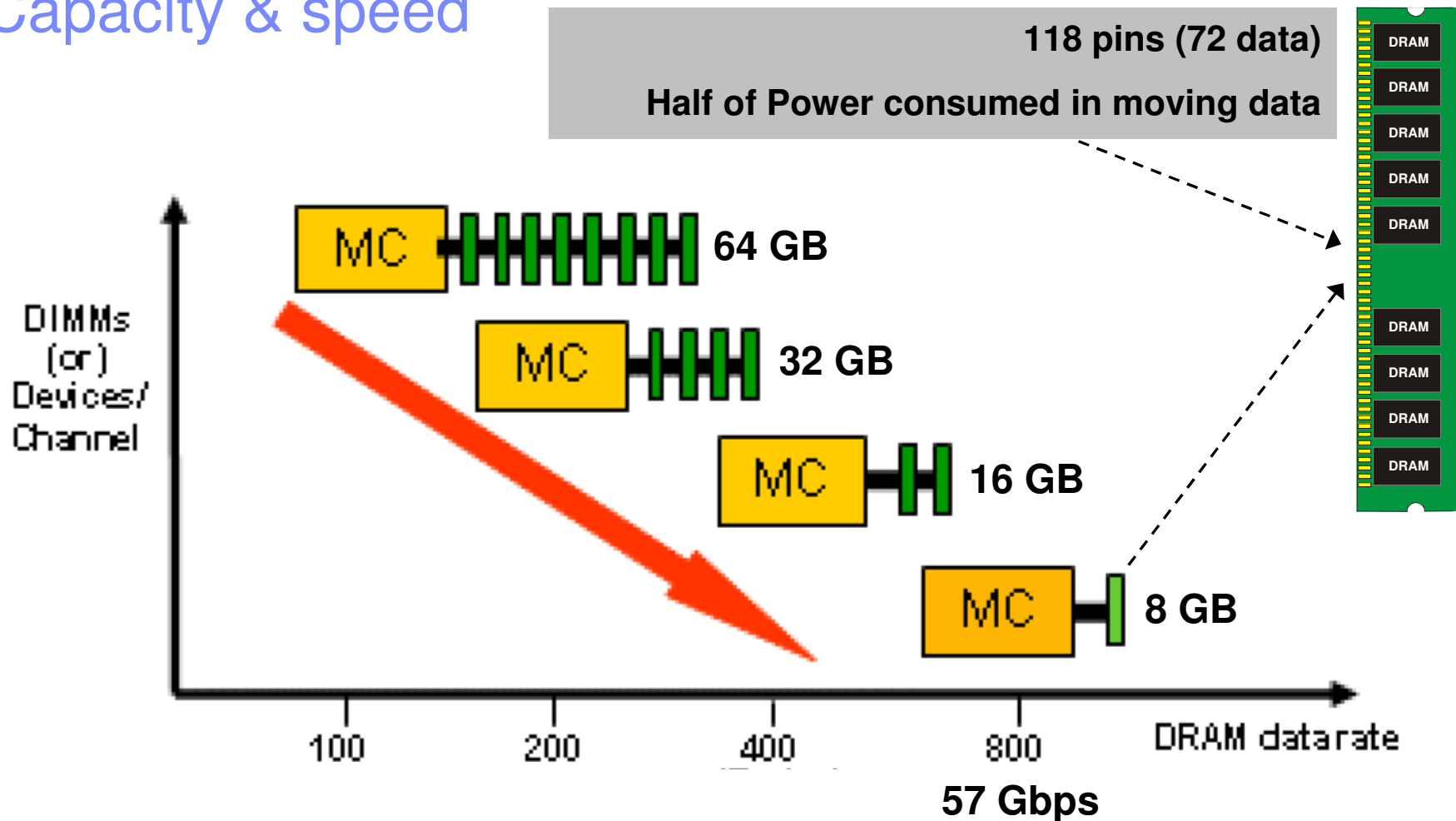**20 Sept 2009 – Vienna, Austria**

What does not work

- **Don't simply replace electronics with Photonics…**

- **We don't need yet another nifty Photonic device…**

Instead

- **Address problems that are not addressed with electronics – but don't go for the BW advantage (how long have you tried that???)**

- **Next slides, an opportunity: example of a current brick wall in servers:**

  – Memory GAP + power wall: it's about simultaneous size and speed

Capacity & speed

118 pins (72 data)

Half of Power consumed in moving data

DIMMs (or) Devices/ Channel

MC ▮▮▮▮▮▮▮▮ **64 GB**

MC ▮▮▮▮ **32 GB**

MC ▮▮ **16 GB**

MC ▮ **8 GB**

100   200   400   800   DRAM data rate

57 Gbps

DIMMs per channel vs data rates (using DDR2 standard)
(original chart Courtesy Hillery Hunter, IBM Watson – with some additions)

And… 3D packaging does NOT solve this

Let's have the good old bus back!!!

- **Make 8 .. 16 way optical multidrop bus**
  - Cannot be done electronically anymore @ speed
  - Almost no activity within the photonics community

Non-research requirements

- **Standards!**

- **DDR, DDR2, DDR3 is there for a reason!**

  – Needed by ecosystem (processor, bridgechip, GPU, DRAM, DIMM manufacturers, system builders)

- **Packaging!**

  – Without good packaging (ie. Cost effective) no success

and you?